

EXHIBIT 6

REDACTED

**UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
SHERMAN DIVISION**

The State of Texas, et. al.
Plaintiff,

v.

Google LLC,
Defendant.

Case No: 4:20-cv-0095wei7

Expert Report of Jacob Hochstetler

6/7/2024

A handwritten signature in black ink, appearing to read "Jacob Hochstetler", written over a horizontal line.

Jacob Hochstetler

12. Further, Section IV describes additional capabilities of Google's ad buying tools. AWBid enables Google Ads to bid into third-party exchanges, in addition to Google's Ad Exchange and facilitates [REDACTED]

[REDACTED]. Section IV then explains how Google's ad serving functionality has changed over time and how it functions today, including the transition away from waterfall to real-time auctions and the introduction of Dynamic Allocation, Enhanced Dynamic Allocation, Header Bidding, Exchange Bidding, and Unified Pricing Rules.

13. Section V describes how AdX was originally designed to be interoperable with third-party ad servers and ad networks. When Google rebuilt the AdX technology in 2009, it was designed to integrate with Google's ad stack (*e.g.*, AdSense, AdWords, DFP); however, publishers and advertisers could use AdX in conjunction with third-party buying tools, ad networks, and/or ad servers. Around 2014, Google began unifying DFP and AdX into a single platform, which culminated in the release of GAM in 2018. Google built a single UI to access both DFP and AdX, integrated DFP and AdX's ad serving infrastructure over time, and built additional features on top of the unified stack. AdX and DFP have separate ad tags (AdX tag and GPT tag, respectively).

[REDACTED]; however, AdX tags are still in use and advertisers are still able to use AdX with a third-party ad server (AdX Direct). While AdX tags and AdX Direct still exist, publishers using AdX tags do not have access to all the features of GPT tags, such as Programmatic Guaranteed, Preferred Deals, Dynamic Allocation, and Exchange Bidding.

14. Section VI describes how Dynamic Allocation (DA) was launched by DoubleClick in 2007. DA enabled AdX and remnant, or non-guaranteed, line items to compete in real-time for impressions not fulfilled by guaranteed line items. At the time, waterfall auctions were used to sell ad slots, where demand sources (*i.e.*, ad exchanges and networks) were ranked in order of historical performance and called sequentially to solicit bids until a demand source provided a suitable ad. This resulted in several inefficiencies, including latency and situations where a publisher may not have maximized their revenue for an impression. With DA, if no guaranteed line item provided a suitable ad, AdX and remnant line items would compete against each other and the winning ad would be served. In the event that there was no eligible remnant line item or a winning AdX candidate, the publisher would promote its own products or services. When DA was launched, AdX was the only exchange with the technical capability to submit real-time bids into DFP, and therefore, participate in DA. Google acquired a "yield manager" platform in 2011 called AdMeld that supported real-time bidding (RTB), (*i.e.*, handling bids from multiple demand

sources to compete in a single real-time auction). [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

15. Section VII describes how Google introduced Enhanced Dynamic Allocation (EDA) in March 2014, which allowed AdX and remnant line items (*e.g.*, third-party exchanges) to compete against guaranteed line items in real-time, while still protecting guaranteed line items' campaign goals. With EDA, publishers may have lost out on revenue from guaranteed and remnant demand sources because while AdX competed for impressions with real-time bids, guaranteed and remnant line items competed using static CPMs. Google transitioned all publishers to EDA by 2016 and did not offer a direct way for publishers to disable or turn off EDA. To circumvent EDA, a publisher could either disable AdX for a single impression or use AdX tags, which are limited in functionality. Within EDA, DFP used remnant line items, which were selected to compete using real-time bids from external third-party buyers, to calculate AdX's price floor. This gave AdX buyers a "Last Look" at other buyers' prices before submitting bids. Last Look led to situations where AdX won auctions that it would have otherwise lost without Last Look. However, Google did not use bids from third-party buyers bidding through Google's own products to inform AdX auction price floors in Last Look. I understand that EDA is still in use today, and that in 2019 Google effectively removed the Last Look from EDA.

16. Section VIII discusses how in 2014, Header Bidding was introduced to resolve the technical challenges associated with waterfall auctions and to promote real-time bidding outside of Google's ad stack. Header Bidding allowed publishers to offer their ad inventory to multiple exchanges simultaneously. Hence, publishers were able to select the winner based on the highest real-time bid, instead of the bidders' historical performance. Header Bidding is implemented by placing HTML or JavaScript code on a publisher's website, which runs an auction for different demand sources before sending the winning bid to the ad server. Header Bidding can be of two types – client-side and server-side – based on whether it is run on the user's browser or an external server. Winning Header Bidding bids are sent into GAM as line items and compete with AdX buyers in real-time. Since Header Bidding bids are usually matched to remnant line items, AdX buyers had a Last Look over Header Bidding buyers until 2019 when Last Look was removed.

from publishers, and purchase ads based on outcomes as opposed to views. Lastly, I describe how Google's ad serving functionality has changed over time and how it functions today.

A. Line items are set in GAM and contain information that defines available advertisements for a publisher's website

58. "Line items" are information fields set in DFP that contain ad information from direct deals with advertisers or ads received from an ad exchange or network.¹²⁴ Line items define how and where ads are intended for display on a website or application. For example, each line item from a direct deal contains details such as the number of times the advertiser wants an advertisement to be shown, negotiated cost for the campaign, campaign period, etc.¹²⁵ Each line item can only belong to one "order," which is a transaction between the publisher and a buyer.¹²⁶ There are different types of line items with varying levels of priority, which are represented by numeric values and help determine how line items compete against each other for an impression. A lower number assigned to a line item reflects its higher priority.¹²⁷

59. Google groups line items into two categories: "guaranteed" (also known as "reservation")¹²⁸ and "non-guaranteed" (also known as "remnant")¹²⁹ line items. **Guaranteed line items are contractually obligated to deliver a set number of impressions**, while non-guaranteed line items are typically used to fill a site's unsold inventory. In other words, when a website does not have enough guaranteed line items to satisfy all available impressions, the remaining (remnant) inventory can be filled using non-guaranteed line items. **Guaranteed line items have a higher priority and are therefore prioritized over non-guaranteed line items.**

60. There are only two types of guaranteed line items: "Sponsorship" and "Standard." There are seven types of non-guaranteed line items: AdSense (or Ad Network); AdX (or Ad Exchange); Preferred Deals; Network; Bulk; Price Priority; and House. In addition to being booked directly by the publisher through the GAM interface, non-guaranteed line items can also represent third-

¹²⁴ Google Ad Manager Help, "About line items," <https://support.google.com/admanager/answer/9405477>. Accessed May 23, 2024.

¹²⁵ Google Ad Manager Help, "About line items," <https://support.google.com/admanager/answer/9405477>. Accessed May 23, 2024.

¹²⁶ Google Ad Manager Help, "Add new line items," <https://support.google.com/admanager/answer/82236>. Accessed May 23, 2024; Google Ad Manager Help, "Get started with ads in Google Ad Manager," <https://support.google.com/admanager/answer/6027116>. Accessed May 23, 2024.

¹²⁷ Google Ad Manager Help, "Line item types and priorities," <https://support.google.com/admanager/answer/177279>. Accessed May 23, 2024.

¹²⁸ Google internal document, "Life of a Bid Request," GOOG-AT-MDL-004221745 at '763 (HCI).

¹²⁹ Google internal document, "Life of a Bid Request," GOOG-AT-MDL-004221745 at '763 (HCI).

D. AdX interoperability with third parties stagnated over time

125. As discussed in Section V.A, AdX was initially designed to be interoperable with third parties, including those that did not use DFP, AdSense, or AdWords. However, as Google developed its “own the tag strategy” and unified DFP and AdX, third party interoperability stagnated over time.

126. As discussed above in Section V.A, when AdX initially launched publishers could access AdX with a third-party ad server using an AdX API. For years after AdX’s launch, Google recognized that this sell-side API was [REDACTED]

[REDACTED] ³⁶¹ However, [REDACTED]
[REDACTED]
[REDACTED].³⁶² One reason for the lack of continued support

for the API and its eventual deprecation was the unification of DFP and AdX into GAM.³⁶³ For example, a feature allowing AdX partners to efficiently manage domains was not planned to be implemented in the AdX API “in light of the DFP+AdX unification project.”³⁶⁴ Thus, [REDACTED]
[REDACTED]

127. AdX tags and AdX Direct also experienced a similar lack of support over time. As discussed in Section V.C, publishers using AdX tags did not have access to all the features available through DFP and GAM, including DA / EDA and Exchange Bidding. As discussed in Sections VI, VII, and IX, these features allowed publishers to compete in real-time and enabled publishers to solicit bids from third-party exchanges in addition to AdX buyers, respectively. Thus, although AdX tags allowed publishers to use AdX without using DFP, they had limited functionality compared to using AdX and DFP together in GAM. Currently, AdX tags are still in use, and it is still possible for publishers to use AdX with a third-party ad server.³⁶⁵ However, the lack of key features for AdX tags compared to GPT tags means that publishers making direct requests to AdX ultimately have fewer opportunities to maximize their yield and revenue.

³⁶¹ Google internal document, “DRK PM Personal One-Pagers 2016,” (June 2016) GOOG-DOJ-28486025 at ‘049 (CI).

³⁶² Google internal document, “DRK PM Personal One-Pagers 2016,” (June 2016) GOOG-DOJ-28486025 at ‘049 (CI).

³⁶³ “Unification brings DFP and AdX into a single UI and ultimately will deprecate the AdX API.” Google internal document, “Per account ICS access,” GOOG-NE-13216501 (HCI).

³⁶⁴ Google internal document, GOOG-AT-MDL-007365338 at ‘366 (HCI).

³⁶⁵ Google, “Generate Ad Exchange ad tags,” <https://support.google.com/admanager/answer/7501422>. Accessed May 30, 2024.

B. Dynamic Allocation enables AdX to compete with remnant inventory in real-time

131. Dynamic Allocation (DA) was first launched by DoubleClick on July 11, 2007 as a purported solution to various inefficiencies in the traditional ad waterfall process.³⁷⁰ Google states that DA solved these inefficiencies by allowing AdX and remnant line items (inclusive of third-party exchanges and networks, as detailed in Section VI.A) to compete against each other in real-time for an impression unfulfilled by a guaranteed line item.³⁷¹

132. [REDACTED]
[REDACTED]³⁷² Thus, at the time AdX was the only exchange [REDACTED]³⁷³ Since DA was a core part of DFP and AdX since its initial launch, the only way for publishers to not use DA was to not call AdX.³⁷⁴

133. DA proceeded in the following steps:

- 1) DFP determined if there was a guaranteed line item eligible to fulfill an ad impression. As discussed in Section IV.A, guaranteed line items are contractually obligated to deliver a specified number of impressions. If such a guaranteed line item existed, DA would not run.³⁷⁵
- 2) Otherwise, a floor price was calculated based on the highest net value CPM (vCPM) of the publisher's remnant line items.³⁷⁶ The vCPM was first specified by publishers, either

³⁷⁰ Google internal document, "Clearing Up Misconceptions About Google's Ad Tech Business," (May 5, 2020) GOOG-NE-10780865 at '880 (HCI); [REDACTED] Deposition, (May 23, 2024) at 105:11-108:16; Google's First Amended Responses and Objections to Plaintiff's Third Set of Interrogatories, (May 24, 2024) at 11.

³⁷¹ Google internal document, "Clearing Up Misconceptions About Google's Ad Tech Business," (May 5, 2020) GOOG-NE-10780865 at '881 (HCI).

³⁷² Google internal document, "[REDACTED]" GOOG-AT-MDL-006690096 at '096 (CI); Standard protocols for real-time bidding were developed several years after the launch of DA. The OpenRTB protocol is an example of such a protocol; IAB Tech Lab, "OpenRTB," <https://iabtechlab.com/standards/openrtb/>. Accessed May 23, 2024; Google, "OpenRTB Integration," <https://developers.google.com/authorized-buyers/rtb/openrtb-guide>. Accessed May 23, 2024.

³⁷³ Google internal document, "[REDACTED]" GOOG-AT-MDL-006690096 at '096 (CI).

³⁷⁴ Nitish Korula Deposition, (May 2, 2024) at 395:5-398:22.

³⁷⁵ Google internal document, "Clearing Up Misconceptions About Google's Ad Tech Business," (May 5, 2020) GOOG-NE-10780865 at '881 (HCI).

³⁷⁶ See Appendix C Section B.6 for findings based on my analysis of Google's source code on the calculation of vCPM in DA.

194. Additionally, because the browser handles multiple calls to demand sources and runs the Header Bidding auction, client-side Header Bidding may affect webpage loading latency.⁵¹³ Even so, this latency can be reduced or eliminated with mitigations such as using more modern networking protocols or optimizing third-party exchanges' auction code.⁵¹⁴

195. The extent to which client-side Header Bidding impacts latency can also vary. For example, [REDACTED]

[REDACTED]

[REDACTED].⁵¹⁵ [REDACTED]

[REDACTED].⁵¹⁶ This showed that client-side Header Bidding is just one of several factors that can affect webpage loading latency and may not always be the main factor.

196. An alternative to client-side Header Bidding is server-side Header Bidding. Unlike in client-side Header Bidding where the browser is responsible for managing the calls to demand sources and running the auction, in server-side Header Bidding the browser calls an external server to manage the process.⁵¹⁷ This allows the browser to focus on serving content, instead of having to spend additional time and resources on the Header Bidding process. Examples of server-side Header Bidding include Prebid Server (a separate product from the Prebid.js wrapper) and Amazon Transparent Ad Marketplace.⁵¹⁸

197. The process of setting up server-side Header Bidding can be more complicated relative to client-side Header Bidding, because an external server needs to be hosted and managed. For

⁵¹³ “[Cons of client-side Header Bidding:] Prone to higher levels of latency and impacted user experience[.]” Google internal document, “Header Bidding Observatory #2,” (May 2017) GOOG-AT-MDL-004300268 at ‘274 (CI); [REDACTED] Deposition (April 26, 2024) at 107:17-24.

⁵¹⁴ Aqeel, W., Bhattacharjee, D., et al., “Untangling Header Bidding Lore: Some Myths, Some Truths, and Some Hope,” In: Sperotto, A., Dainotti, A., Stiller, B. (eds) Passive and Active Measurement. PAM 2020. Lecture Notes in Computer Science, vol 12048. Springer, Cham. https://doi.org/10.1007/978-3-030-44081-7_17.

⁵¹⁵ Google internal email, “[REDACTED],” (May 5, 2017) GOOG-DOJ-14739278 at ‘281 (HCI).

⁵¹⁶ Google internal email, “Re: Catchpoint - MailOnline URL endpoints,” (February 13, 2018) GOOG-DOJ-14744242 at ‘252 (HCI).

⁵¹⁷ Google internal document, “Header Bidding Observatory #2,” (May 2017) GOOG-AT-MDL-004300268 at ‘274 (CI); Taylor, R., Criteo, “Header Bidding Demystified: Client-Side vs. Server-Side,” (June 13, 2022) <https://www.criteo.com/blog/header-bidding-demystified-client-side-vs-server-side/>. Accessed May 23, 2024.

⁵¹⁸ Prebid, “Prebid Server Overview,” <https://docs.prebid.org/prebid-server/overview/prebid-server-overview.html>. Accessed May 24, 2024; Amazon, “Transparent Ad Marketplace,” <https://aps.amazon.com/aps/transparent-ad-marketplace/>. Accessed May 23, 2024.

1) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED].

2) [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

215. [REDACTED]
[REDACTED]
[REDACTED].⁵⁵⁰

216. This example with the Bid Data Transfer files shows that Google was able to limit information and transparency about its auctions to publishers.

217. To conclude, Exchange Bidding was Google's response to Header Bidding with a self-stated goal of resolving the technical challenges of Header Bidding. Unlike Header Bidding, which is usually implemented on the client-side, Exchange Bidding is a server-side solution, meaning that Google controls and mediates the process of interacting with bidders. As a result, exchange bidding resulted in in reduced visibility into the auction dynamics on the external server. Google states that Exchange Bidding demand sources and AdX demand sources compete equally in the unified auction on a net basis.

X. GOOGLE IMPLEMENTS PROJECT BERNANKE TO ADJUST GOOGLE ADS USERS' BIDS

A. Google released four iterations of Project Bernanke which adjusted Google's ad buying tool bids to win more auctions

218. Project Bernanke is an internal Google program within Google Ads designed to adjust advertiser bids to increase the numbers of auctions won by Google Ads in AdX and increase the

⁵⁴⁹ See [REDACTED] Deposition, (April 3, 2024) at 169:20-171:20.

⁵⁵⁰ [REDACTED]

revenue of Google Ads.⁵⁵¹ Project Bernanke was implemented in four phases – “Original Bernanke” in 2013, “Global Bernanke” in 2015, “Project Bell v2” in 2016 and “1P Bernanke” in 2019. Original Bernanke, Global Bernanke, and 1P Bernanke all maintained Bernanke pool(s) of money to subsidize bids in auctions where Google Ads bids would have lost, and recouped money through bid adjustments in auctions where bids from Google Ads bidders ranked on top.⁵⁵² [REDACTED]

[REDACTED],⁵⁵³

219. As previously stated, Google Ads has an internal buy-side auction, the CAT2 auction, that determines the highest Google Ads bids for submission into the AdX auction.⁵⁵⁴ Within CAT2, the top one or two Google Ads bids, depending on the type of AdX auction, are selected⁵⁵⁵ and submitted to compete in the AdX auction.⁵⁵⁶ If a Google Ads bid wins the AdX auction, Google Ads takes a 14-15%⁵⁵⁷ revenue share from the payment made by the winning advertiser, which it extracts prior to the submission into the auction (*e.g.*, if the advertiser bid \$1.00, the bid that went into the AdX auction would be for \$0.85 to reflect a 15% revenue share for Google).⁵⁵⁸

220. At its launch, AdX operated as a modified second-price auction, meaning that the highest-bidding advertiser won the impression and paid the higher of either the reserve price or the

⁵⁵¹ [REDACTED]

[REDACTED] (September 5, 2019) GOOG-AT-MDL-B-002547429 at ‘430 (CI); Atil Iscen Deposition, (April 1, 2024) at 57:11-57:18; Google internal document, “Project Bernanke,” (October 21, 2013) GOOG-AT-MDL-009831407 at ‘409 (CI); [REDACTED] Deposition, (April 3, 2024) at 195:22-197:8.

⁵⁵² Google internal document, “Native Formats Update,” GOOG-NE-02635108 at ‘112 (HCI); Google internal document, “The Alchemist,” (March 2019) GOOG-DOJ-AT-02224828 at ‘828 (HCI); Google internal document, “Alchemist: the Game of Arbitrage,” GOOG-DOJ-AT-00568762 at ‘762 (HCI); Nirmal Jayaram Deposition (April 26, 2024) at 94:2-8.

⁵⁵³ See Appendix C Section B.19 for confirmation based on my analysis of Google's source code on Bernanke implementation in 2023.

⁵⁵⁴ After Project SkyRay in 2014-2017, bids from DV360 as well as Google Ads use the CAT2 infrastructure, as described in Section IV.F, but the functionality of selecting Google Ads bids remains unchanged. Google internal document, “CAT2 First Price Auction,” GOOG-AT-MDL-018531517 at ‘520 (HCI). Only DV360 PPO ads compete in the same auction with Google Ads bids prior to submission into CAT2.

⁵⁵⁵ Prior to 2019, when AdX ran second-price auctions, CAT2 submitted up to two bids to AdX. In some cases, Google Ads could submit one or zero bids if it didn't have enough bids for a specific auction. Since AdX switched to a first-price model in 2019, CAT2 has been submitting only one bid.

⁵⁵⁶ Google internal document, “Supermixer,” (January 2020) GOOG-AT-MDL-001421306 at ‘308 (HCI); Google internal document, “CAT2 First Price Auction,” GOOG-AT-MDL-018531517 at ‘520 (HCI).

⁵⁵⁷ Google Ads revenue share increased from 14% to 15% in the period between 2013 and 2016. Google internal document, “AdX Auction Optimizations,” (May 10, 2016) GOOG-NE-06842715 at ‘730 (HCI).

⁵⁵⁸ Google internal document, “Native Formats Update,” GOOG-NE-02635108 at ‘112 (HCI); Google internal document, “Quality Revenue Optimizations Overview,” (June, 2020) GOOG-DOJ-AT-01509153 at ‘153 (HCI).

B. The original version of Project Bernanke adjusted bids while maintaining a fixed margin per publisher

222. The first version of Project Bernanke, “original Bernanke,” was launched on November 11, 2013 on all AdX ad opportunities.⁵⁷³ The program functioned by accumulating pools of money from some auctions and using that money to inflate bids in other auctions.⁵⁷⁴ More specifically, in auctions where Google Ads bids were higher than the floor and other bids in the auction, Google Ads could decrease advertiser bids to secure ad impressions at a lower cost, while still charging the advertiser the higher price for the impression.⁵⁷⁵ Conversely, when Google Ads bids were not high enough to win an auction, Bernanke could inflate advertiser bids to win the auction while only charging the advertisers the lower cost of their original bid.⁵⁷⁶ Figure 27 and Figure 28 provides a visual of the scenario in which Bernanke was used to build a Bernanke pool on auctions where Google Ads placed the two highest bids and a scenario in which Bernanke was used to subsidize a bid Google Ads would have otherwise lost. A predictive algorithm determined whether to collect money or subsidize bids in each auction prior to submission into AdX.⁵⁷⁷

⁵⁷³ Nirmal Jayaram Deposition, (April 26, 2024) at 112:11-14; Google’s First Am. Resps. and Objs. to Plaintiff’s Third Set of Interrogs. (May 24, 2024) at 12.

⁵⁷⁴ Google internal document, “gTrade Team Background,” GOOG-NE-13624783 at ‘785 (HCI).

⁵⁷⁵ Google internal document, “gTrade Team Background,” GOOG-NE-13624783 at ‘785 (HCI); Nirmal Jayaram Deposition, (April 26, 2024) at 319:21-320:5.

⁵⁷⁶ Google internal document, “gTrade Team Background,” GOOG-NE-13624783 at ‘785 (HCI).

⁵⁷⁷ Google internal document, “Project Bernanke and margins story,” (2019) GOOG-AT-MDL-001412616 at ‘622 (CI).

“June 2023” snapshot, the [REDACTED]

[REDACTED].⁵⁷⁹ For example, on Day Eight, [REDACTED]

[REDACTED]⁵⁸⁰ I understand that over the course

of time the portion of online experiments⁵⁸¹ may have changed.⁵⁸²

224. [REDACTED]

225. [REDACTED]

[REDACTED]⁵⁸⁵ In the

first two versions of Project Bernanke – original Bernanke and Global Bernanke – [REDACTED]

⁵⁷⁹ Google internal document, “AdX + gTrade Overview,” (October 14, 2014) GOOG-DOJ-AT-00245254 at ‘283 (HCI).

⁵⁸⁰ See Appendix C Section B.3 for findings from my analysis of Google’s source code on the configuration of Bernanke offline experiments.

⁵⁸¹ “Online experiments” in this context meaning situations in which exploratory values of Bernanke multipliers are applied to live auction traffic. See Appendix C Section B.22 for findings from my analysis of Google’s source code on the configurations of Bernanke online experiments.

⁵⁸² For example, according to an internal document the initial version of Bernanke in 2014 only the [REDACTED]. See Google internal document, “Rethinking Bernanke: Grid search to line search,” (October 30, 2014) GOOG-AT-MDL-008881638 at ‘638 (HCI).

⁵⁸³ See Appendix C Section B.22 for findings from my analysis of Google’s source code on the configurations of Bernanke online experiments.

⁵⁸⁴ Google internal document, “Rethinking Bernanke: Grid search to line search,” (October 30, 2014) GOOG-AT-MDL-008881638 at ‘638 (HCI); Google internal document, “Project Bernanke and margins story,” (2019) GOOG-AT-MDL-001412616 at ‘622 (CI); see Appendix C Section B.3 for findings from my analysis of Google’s source code on the configuration of Bernanke offline experiments.

⁵⁸⁵ Google internal document, “Rethinking Bernanke: Grid search to line search,” (October 30, 2014) GOOG-AT-MDL-008881638 at ‘638 (HCI); Google internal document, “Bernanke and Bell,” GOOG-AT-MDL-018243919 at ‘921, ‘925 (HCI).

while *beta* ranged from 0 to 0.85, meaning the second-highest bid value was lowered anywhere from 0 to 0.85 of its original value.⁵⁸⁶

226. In the context of a second-price auction, which was how AdX functioned during the first two versions of Project Bernanke, [REDACTED]

[REDACTED]⁵⁸⁷ [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]⁵⁸⁸ The

difference between advertiser charge and publisher payout left Google Ads with a surplus of money. Google Ads retains its contractual 14-15% revenue share by subtracting from the surplus and placed the rest in a pool, which I refer to as the Bernanke pool.⁵⁸⁹

227. The money collected in the Bernanke pools was used to subsidize bids in competitive auctions. Specifically, this money was used to inflate bids that the predictive algorithm determined would have otherwise been too low to win a given auction.⁵⁹⁰ In particular, Google borrowed money from a pool to raise the highest advertiser bid, while charging the highest bidding advertiser the original value of their bid, as they would in a first-price auction.⁵⁹¹ The original Bernanke maintained pools for each publisher – in other words, money withheld from a given publisher was only used to inflate bids in auctions for the same publisher.⁵⁹² [REDACTED]

[REDACTED]
[REDACTED]⁵⁹³ [REDACTED]
[REDACTED]
[REDACTED]⁵⁹⁴

228. Figure 29 shows an example auction that demonstrates how Google built a pool using original Bernanke. Take an auction where Google Ads submits the two highest bids, \$1.20 and

⁵⁸⁶ Google internal document, “Bernanke and Bell,” GOOG-AT-MDL-018243919 at ‘921, ‘925 (HCI); Nirmal Jayaram Deposition, (April 26, 2024) at 109:18-21.

⁵⁸⁷ Google internal document, GOOG-AT-MDL-016354537 at ‘540 (CI).

⁵⁸⁸ Google internal document, GOOG-AT-MDL-016354537 at ‘540 (CI).

⁵⁸⁹ Google internal document, GOOG-AT-MDL-016354537 at ‘540 (CI).

⁵⁹⁰ Google internal document, GOOG-AT-MDL-016354537 at ‘540 (CI).

⁵⁹¹ Google internal document, GOOG-AT-MDL-016354537 at ‘540 (CI).

⁵⁹² Google internal document, GOOG-AT-MDL-016354537 at ‘542 (CI).

⁵⁹³ See Appendix C Section B.20 for findings from my analysis of Google's on the implementation of Bernanke pool for bid adjustment.

⁵⁹⁴ See Appendix C Section B.21 for findings from my analysis of Google's on the implementation of Bernanke pool for safety mechanism.

286. I understand that Google provided a checkbox that permitted advertisers to opt out of Project Poirot, which said “[o]ptimize my fixed bidding to help me get the best possible price for each impression.”⁷⁹⁸ I further understand that the default was that Project Poirot was enabled, and that less than one percent of advertisers opted out.⁷⁹⁹

287. After rolling out Project Poirot, Google launched Project Marple.⁸⁰⁰ Project Marple applied the Project Poirot methodology to Google Ads (formerly AdWords).⁸⁰¹ As with Poirot, Marple also uses the past seven days of data to train the model.⁸⁰² I understand that after the unified first-price migration, both AdWords (Marple) and DV360 (Poirot) used the minimum bid to win data.⁸⁰³ As with Bernanke, Marple took place after AdWords ran its auction, but before the bids were submitted to AdX.⁸⁰⁴ I understand that Project Poirot is still running today.⁸⁰⁵

XIII. GOOGLE IMPLEMENTED RESERVE PRICE OPTIMIZATION TO DYNAMICALLY INCREASE ADX FLOOR PRICES

288. Reserve Price Optimization (RPO), also known as “Dynamic Reserve Price Optimization,” “AdX Dynamic Price” and publicly marketed as “Optimized Pricing” is an automated feature that dynamically increases auction floors to be as close to the anticipated highest bid as possible.⁸⁰⁶

289. Google released two types of RPO: second-price RPO, which was initially launched in March of 2015 and designed for second-price auctions, and first-price RPO (fRPO), which was launched in 2022 and designed to account for the changes accompanying AdX’s transition to a first-price model.⁸⁰⁷ I explain both in detail in the following subsections.

⁷⁹⁸ Nirmal Jayaram Deposition, (April 26, 2024) at 353:18-354:23.

⁷⁹⁹ Nirmal Jayaram Deposition, (April 26, 2024) at 249:9-250:21.

⁸⁰⁰ Nirmal Jayaram Deposition, (April 26, 2024) at 256:11-15.

⁸⁰¹ Nirmal Jayaram Deposition, (April 26, 2024) at 255:17-256:25, 396:11-15.; Nirmal Jayaram Deposition, (April 26, 2024) at 257:2-6.

⁸⁰² Nirmal Jayaram Deposition, (May 21, 2024) at 431:25-432:5.

⁸⁰³ Nirmal Jayaram Deposition, (May 21, 2024) at 396:17-21.

⁸⁰⁴ Nirmal Jayaram Deposition, (May 21, 2024) at 395:20-10.

⁸⁰⁵ Nirmal Jayaram Deposition, (April 26, 2024) at 259:16-19.

⁸⁰⁶ Google internal document, “2-Pager: RPO + OPR Commercialization,” GOOG-AT-MDL-000989823 at ‘823-824 (HCI); [REDACTED] Deposition, (April 19, 2024) at 105:22-106:10.

⁸⁰⁷ Google internal document, “This document lists launches where the responsible [REDACTED], selected from Ariane with dates after Jan 2015, and launches from DRX IAS team selected since Jan 2016,” GOOG-DOJ-15435288 at ‘289 (HCI); Google’s First Amended Responses and Objections to Plaintiff’s Third Set of Interrogatories, (May 24, 2024) at 12.